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EXAMINER

GEBREYESUS, YOSEF

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|--------------------------------------|------------------------------------|--|
| Office Action Summary | Application No. 10/534,956 | Applicant(s) KOHL ET AL. | |
| | Examiner YOSEF GEBREYESUS | Art Unit 2811 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 April 2011.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 24-31, 33-50 and 52-55 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 24-31, 33-50 and 52-55 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 04/11/2011 has been entered.

Oath/Declaration

2. The Oath/Declaration filed on 04/27/2007 is acceptable.

Specification

3. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

4. Claims 24-26,29,31,33-40,46-47,50 and 52-55, are objected to because of the following informalities:

5. Claim 24, in line 4, lines 8-9, line 10, line 11 and line 13 recites the limitation "the sacrificial layer" which appears to be "the photodefinable sacrificial layer".

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6. Claim 24, in line 14, recites the limitation “the overcoat layer” which appears to be “the contiguous overcoat layer”.
7. Claim 25, in lines 3 and 4, recites the limitation “the sacrificial layer” which appears to be “the photodefinable sacrificial layer”.
8. Claim 26, in line 2, recites the limitation “the sacrificial layer” which appears to be “the photodefinable sacrificial layer”.
9. Claim 26, in line 2, page 3, recites the limitation “the overcoat layer” which appears to be “the contiguous overcoat layer”.
10. Claim 29, in line 2, page 3, recites the limitation “the overcoat layer” which appears to be “the contiguous overcoat layer”.
11. Claim 31, in line 2, page 3, recites the limitation “the overcoat layer” which appears to be “the contiguous overcoat layer”.
12. Claim 31, in line 3, page 3 recites the limitation “the sacrificial layer” which appears to be “the photodefinable sacrificial layer”.
13. Claim 33, in line 2, page 3, recites the limitation “the overcoat layer” which appears to be “the contiguous overcoat layer”.
14. Claim 34, in line 2, page 3, recites the limitation “the overcoat layer” which appears to be “the contiguous overcoat layer”.
15. Claim 35, in line 2, page 3, recites the limitation “the overcoat layer” which appears to be “the contiguous overcoat layer”.
16. Claim 36, in line 2, page 4, recites the limitation “the overcoat layer” which appears to be “the contiguous overcoat layer”.

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17. Claim 37, in line 3, page 4, recites the limitation “the sacrificial layer” which appears to be “the photodefinable sacrificial layer”.

18. Claim 38, in line 3, page 4, recites the limitation “the overcoat layer” which appears to be “the contiguous overcoat layer”.

19. Claim 39, in line 3-4 and line 7, page 4, recites the limitation “the overcoat layer” which appears to be “the contiguous overcoat layer”.

20. Claim 40, in line 3 and lines 4-5, page 4, recites the limitation “the overcoat layer” which appears to be “the contiguous overcoat layer”.

21. Claim 46, in line 2, page 5, recites the limitation “the sacrificial layer” which appears to be “the photodefinable sacrificial layer”.

22. Claim 47, in line 3, page 5, recites the limitation “the sacrificial layer” which appears to be “the photodefinable sacrificial layer”.

23. Claim 50, in line 2, page 6, recites the limitation “the sacrificial layer” which appears to be “the photodefinable sacrificial layer”.

24. Claim 52, in line 3, page 6, recites the limitation “the overcoat layer” which appears to be “the contiguous overcoat layer”.

25. Claim 53, in line 2, page 6, recites the limitation “the overcoat layer” which appears to be “the contiguous overcoat layer”.

26. Claim 54, in line 2, page 6, recites the limitation “the overcoat layer” which appears to be “the contiguous overcoat layer”.

27. Claim 55, in line 2, page 6, recites the limitation “the overcoat layer” which appears to be “the contiguous overcoat layer”.

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28. Appropriate correction is required.

Claim Rejections - 35 USC § 103

29. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

30. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

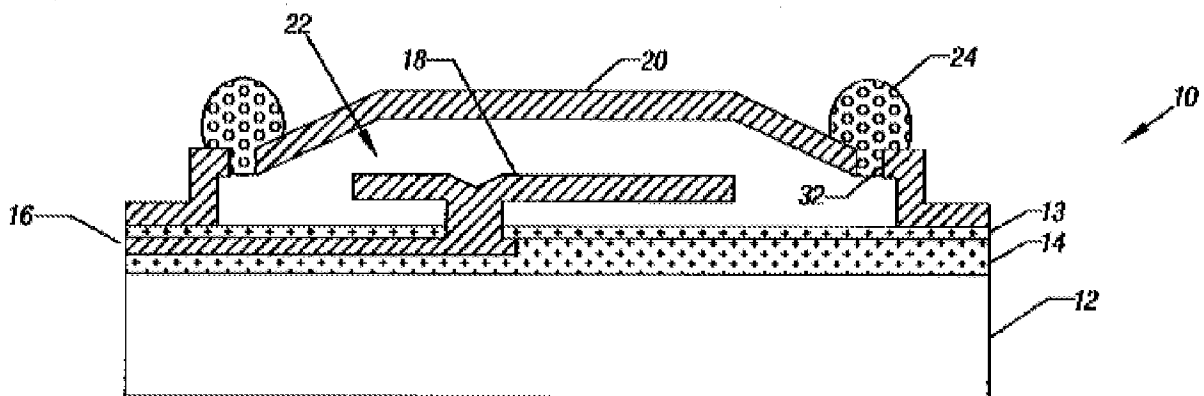
1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

31. **Claims 24-28, 30-31, 33-36, 40, 42, 50, 52-55**, are rejected under 35 U.S.C. 103(a) as being unpatentable over Heck et al. (US 2003/0183916, dated October 2nd, 2003, filed March 27th, 2002; hereinafter Heck) in view of Mule' et al. (US 2002/0136481, dated September 26th, 2002, filed February 11th, 2002; hereinafter Mule).

32. Regarding **claim 24**, figures 1-8 (one embodiment) and related text of Heck discloses forming a thermally decomposable sacrificial layer 15 and 25 (paragraph [0015]) on a substrate 12 of a micro electro-mechanical device 18, the sacrificial layer 15 & 25 encapsulating a portion of the micro electro- mechanical device 18 (paragraph

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[0013]); said sacrificial layer is patterned (paragraph [0016] and [0017]); forming a contiguous overcoat layer (cover) 20 (the cover is formed without openings 32) (paragraph [0018], [0021]) around the sacrificial layer 15 & 25; and thermally decomposing the sacrificial layer (paragraph [0015]), wherein decomposed molecules of the sacrificial layer permeate through the overcoat layer 20 (paragraph [0021]), and wherein a gas cavity 22 (paragraph [0014]) is formed where the thermally decomposable sacrificial layer 15 & 25 was formed, wherein the contiguous overcoat layer 20 provides an airtight (hermetic seal or vacuum cavity) (paragraph [0014] lines 11-15) and enclosure around the gas cavity 22 (paragraph [0014]).

**FIG. 1**

Heck teaches the sacrificial material is polynorbornene (paragraph [0015]). Heck does explicitly disclose the sacrificial layer is photodefinable and image wise exposing to form a pattern.

However, in the same field of endeavor, figures 1A-1C and related text of Mule discloses using a photodefinable (photosensitive polynorbornene) (paragraph [0055])

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material as a sacrificial layer and forming a pattern by using an image wise exposing method (ultra violet radiation) (paragraph [0058]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the pattern of Heck's device by using an image wise exposing method as taught by Mule. The ordinary artisan would have been motivated to use such method because it is conventional and known in the art to form patterns by exposing to light.

33. Regarding **claim 25**, figures 1-8 (one embodiment) and related text of Heck discloses depositing the sacrificial layer 15 by spin-coating (paragraph [0015]); and patterning the sacrificial layer (paragraph [0016]).

34. Regarding **claim 26**, figures 1-8 (one embodiment) and related text of Heck discloses where the sacrificial layer 15 & 25 has a decomposition temperature less than a decomposition temperature of the substrate and a decomposition temperature of the overcoat layer 20 (the sacrificial layer 15/25 decomposes through the cover layer 20, which inherently indicates the decomposition temperature of the substrate and the cover is higher than the decomposition temperature of the sacrificial layer, paragraph [0015] & [0021]).

35. Regarding **claims 27 & 28**, figures 1-8 (one embodiment) and related text of Heck substantially discloses the claimed invention except wherein the substrate comprises a silicon material or a non-silicon material.

However, in the same field of endeavor figures 1A-1C and related text of Mule discloses a microelectronic package (paragraph [0034], [0038]) wherein the substrate layer 100 comprises silicon or non silicon (germanium) material (paragraph [0038]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form Heck's device substrate with silicon or germanium material as taught by Mule. The ordinary artisan would have been motivated to use such materials as a substrate because in a semiconductor manufacturing process, silicon or germanium material are known and conventional for making device substrates. Since Mule teaches that these are conventional substrate materials (paragraph [0038]), it has been held that the selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

36. Regarding **claim 30**, figures 1-8 (one embodiment) and related text of Heck discloses where the overcoat layer (cover) 20 has not been perforated (sealed by sealing material 34) (paragraph [0021]).

37. Regarding **claim 31**, figures 1-8 (one embodiment) and related text of Heck discloses where the overcoat layer 20 is substantially free of sacrificial layer after the sacrificial layer has been thermally decomposed (paragraph [0021] discloses the sacrificial layers 15 and 25 pass through the porous cover 20; thus the overcoat layer 20 is considered free of sacrificial material 15 & 25).

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38. Regarding **claim 33**, the limitation "the overcoat layer provides protection from mechanical forces" is merely a functional/intended use limitation that does not structurally distinguish the claimed invention over the prior art. While features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997).

39. Regarding **claim 34**, the limitation "the overcoat layer further provides protection against water" is merely a functional/intended use limitation that does not structurally distinguish the claimed invention over the prior art. While features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997).

40. Regarding **claim 35**, the limitation "the overcoat layer further provides protection against oxygen gas" is merely a functional/intended use limitation that does not structurally distinguish the claimed invention over the prior art. While features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997).

41. Regarding **claim 36**, the limitation "the overcoat layer further provides protection against exposure to gaseous materials" is merely a functional/intended use limitation

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that does not structurally distinguish the claimed invention over the prior art. While features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997).

42. Regarding **claim 40**, figures 1-8 (one embodiment) and related text of Heck discloses forming a barrier layer 34 around the overcoat layer 20. The limitation "the barrier layer providing a stronger protection against mechanical forces than the overcoat layer" is merely a functional/intended use limitation that does not structurally distinguish the claimed invention over the prior art. While features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997).

43. Regarding **claim 42**, figures 1-8 (one embodiment) and related text of Heck and figure 12 of Partridge disclose creating a vacuum inside the gas cavity by heating the micro electro-mechanical device in a chamber (paragraph [0014] and [0015]); and after the vacuum is created, forming a barrier layer (sealing material) 34 around the overcoat layer (cover) 20 within the chamber (controlled environment) (paragraph [0020]) to provide a vacuum-packed enclosure around the gas cavity 22, the barrier layer 34 comprising a metal material (paragraph [0018]).

44. Regarding **claim 50**, figures 1-8 (one embodiment) and related text of Heck and figures 1a-1c of Mule substantially discloses the claimed invention except wherein

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thermal decomposition temperature of the sacrificial layer is less than 100 degrees Celsius.

However, in the same field of endeavor, figures 1a-1c of Mule teaches using a low temperature sacrificial layer (polycarbonate) (paragraph [0055] line 3) which is the same material as the claimed invention (same material will have the same decomposition temperature). One of ordinary skill in the art would have recognized that forming the sacrificial layer comprising a material with a decomposition temperature less than 100 degrees celsius would have been a predictable variation in order to form a cavity in the semiconductor device. *See MPEP 2144.05 and MPEP 2143 KSR Rationale (F) Known Work in One Field of Endeavor May Prompt Variations of It for Use in Either the Same Field or a Different One Based on Design Incentives or Other Market Forces if the Variations Are Predictable to One of Ordinary Skill in the Art.*

Moreover, there is no evidence indicating the ranges of the sacrificial temperature is critical and it has been held that it is not inventive to discover the optimum or workable range of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising there from. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicants must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the sacrificial layer of Heck's device with low temperature sacrificial material such as polycarbonate as taught by Mule. The ordinary artisan would have been motivated to use low temperature sacrificial material, in order to avoid exposing other parts of the device from high temperature during processing.

45. Regarding **claim 52**, figures 1-8 (one embodiment) and related text of Heck discloses where said gas cavity 22 is formed while decomposed molecules produced by decomposition of the sacrificial layer permeate the first overcoat layer 20 (paragraph [0014] and [0021]).

46. Regarding **claims 53-54**, figures 1-8 (one embodiment) and related text of Heck substantially disclose the claimed invention except the overcoat layer comprises a polymer or photodefinable polymer.

However, in the same field of endeavor, figures 1a-1c of Mule discloses the overcoat layer 150 comprises a polyimide or photodefinable polymer (Avatrel) (paragraph [0061]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the overcoat layer of Heck's device with a polyimide or a photodefinable polymer material as taught by Mule because such materials are conventional in the art for forming over coat layers. Since Mule teaches that photodefinable polymer is conventional overcoat material, It has been held that the selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*,

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325 U.S. 327, 65 USPQ 297 (1945). See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

47. Regarding **claim 55**, figures 1-8 (one embodiment) and related text of Heck discloses where said overcoat layer 20 is a solid overcoat layer (metal or dielectric used to form hermetic barrier).

48. **Claim 29**, is rejected under 35 U.S.C. 103(a) as being unpatentable over Heck et al. (US 2003/0183916, dated October 2nd, 2003, filed March 27th, 2002; Hereinafter Heck) in view of Mule' et al. (US 2002/0136481, dated September 26th, 2002, filed February 11th, 2002; hereinafter Mule) as applied to claim 24 above, and further in view of Freidhoff (US 2003/0155643, dated August 21st, 2003, filed February 19th, 2002

49. Regarding **claim 29**, the combination of Heck and Mule substantially disclose the claimed invention except the thickness of the overcoat layer is within the range of 50nm and 500 um.

However, in the same field of endeavor figures 1-12 and related text Freidhoff teaches a similar device wherein the thickness of the overcoat layer (helmet) 54 is 5um (paragraph [0032]). One of ordinary skill in the art would have recognized that forming the overcoat layer within the claimed thickness range would have been a predictable result in order to decompose the entire sacrificial layer through the overcoat layer. See *MPEP 2143 KSR Rationale (F) Known Work in One Field of Endeavor May Prompt Variations of It for Use in Either the Same Field or a Different One Based on Design*

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Incentives or Other Market Forces if the Variations Are Predictable to One of Ordinary Skill in the Art.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form an overcoat layer of the combination of Heck's and Mule's device with a thickness 5 um as taught by Freidhoff. The ordinary artisan would have been motivated to form the thickness of the overcoat layer of the combined teachings of Heck and Mule within the claimed range in order to make smaller devices (Freidhoff; paragraph [0032]).

50. **Claim 37**, is rejected under 35 U.S.C. 103(a) as being unpatentable over Heck et al. (US 2003/0183916, dated October 2nd, 2003, filed March 27th, 2002; Hereinafter Heck) in view of Mule' et al. (US 2002/0136481, dated September 26th, 2002, filed February 11th, 2002; hereinafter Mule) as applied to claim 24 above and further in view of Gallagher et al. (US 2004/0137728, dated July 15th, 2004, dated September 13th, 2003; hereinafter Gallagher).

51. Regarding **claim 37**, the combination of Heck and Mule substantially disclose the claimed invention except wherein the micro electro- mechanical device includes a released mechanical structure before the sacrificial layer is formed.

However, in the same field of endeavor, figures 1A-1D of Gallagher discloses forming a released mechanical structure (metal lines) 15 before the sacrificial material 20 is formed (paragraph [0068]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the released structure of the combination of Heck's and Mule's device before the sacrificial material is formed as taught by Gallagher. The ordinary artisan would have been motivated to form the combined teachings of Heck's and Mule's device in the above manner in order reduce process steps such as patterning the sacrificial layer to form the released structure.

52. **Claims 38-39,43-45, 47-49**, are rejected under 35 U.S.C. 103(a) as being unpatentable over Heck et al. (US 2003/0183916, dated October 2nd, 2003, filed March 27th, 2002; Hereinafter Heck) in view of Mule' et al. (US 2002/0136481, dated September 26th, 2002, filed February 11th, 2002; hereinafter Mule) as applied to claim 24 above and further in view of Silverbrook (US 2003/0122227, dated July 3rd, 2003, filed January 8th, 2002).

53. Regarding **claim 38**, figures 1-8 (one embodiment) and related text of Heck and figures 1a-1c Mule substantially disclose the claimed invention except before the overcoat layer is formed, attaching the micro electro-mechanical device to a metal packaging frame, where the overcoat layer comprises an epoxy resin encapsulating the micro electro-mechanical device and metal packaging frame assembly.

However, in the same field of endeavor figure 23 of Silverbrook discloses before the overcoat layer (protective layer, epoxy) 218 is formed, attaching the micro-electro-mechanical device to an integrated circuit package structure 216 (lead frame) (paragraph [0069]).

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Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Heck and Mule with the teachings of Silverbrook by attaching the micro electro-mechanical device to an integrated package structure comprising lead frame and forming an epoxy overcoat layer. The ordinary artisan would have been motivated to form the combination of Heck's and Mule's device in the above manner for the purpose of forming electrical connection between the MEMS device and external devices and to provide environmental protection.

54. Regarding **claim 39**, figures 1-8 (one embodiment) and related text of Heck discloses heating the micro assembly at a temperature (350°C - 425°C, which is a higher temperature, than the temperature for curing of an epoxy or overcoat layer, supporting document for epoxy curing temperature, see Bentley et al., US 3,639,928 co. 2 lines 38-40) for decomposing the sacrificial layer (paragraph [0015]).

The combination of Heck and Mule do not disclose heating the micro assembly at a temperature for curing the overcoat layer.

However, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to heat the micro assembly device of Heck and Mule at a temperature for curing the overcoat layer (epoxy layer), because it is conventional and Known in the semiconductor manufacturing art to cure an epoxy material for the purpose of making protection layer.

55. Regarding **claims 43-44**, figures 1-8 (one embodiment) and related text of Heck and figures 1a-1c of Mule substantially disclose the claimed invention except after the

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barrier layer is formed, attaching the micro electro-mechanical device to an integrated circuit package structure; and encapsulating the electro-mechanical device and integrated circuit package structure in a surrounding structure.

However, in the same field of endeavor figure 23 of Silverbrook discloses attaching the micro-electro-mechanical device to an integrated circuit package structure 216 (lead frame).

Therefore in view of such teachings, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Heck's and Mule with the teachings of Silverbrook by attaching the micro electro-mechanical device to an integrated package structure comprising lead frame. The ordinary artisan would have been motivated to form the combination of Heck's and Mule's device in the above manner for the purpose of forming electrical connection between the MEMS device and external power supplies.

56. Regarding, **claim 45**, figures 1-8 (one embodiment) and related text of Heck and figures 1a-1c of Mule substantially disclose the claimed invention except the integrated circuit package comprises a ceramic package.

However, in the same field of endeavor figure 23 of Silverbrook discloses encapsulating (paragraph [0069]) the electro-mechanical device and integrated circuit package structure with a ceramic package (paragraph [0002]).

Therefore in view of such teachings, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined teachings of Heck's and Mule with the teachings of Silverbrook by encapsulating the

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micro electro-mechanical device with a ceramic package. The ordinary artisan would have been motivated to form the combination of Heck's and Mule's device in the above manner in order to provide an additional mechanical and environmental protection.

57. Regarding, **claim 47**, figures 1-8 (one embodiment) and related text of Heck discloses after the sacrificial layer 15 & 25 is decomposed (paragraph [0015]) encapsulating the electro-mechanical device and package structure in a protective coating 34 (paragraph [0021]).

The combination of Heck and Mule do not disclose attaching the micro electro-mechanical device to an integrated circuit package structure.

However, in the same field of endeavor, figure 23 of Silverbrook discloses attaching the micro-electro-mechanical device to an integrated circuit package structure 216 (lead frame) (paragraph [0069]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Heck's and Mule's with the teachings of Silverbrook by attaching the micro electro-mechanical device to an integrated circuit package structure. The ordinary artisan would have been motivated to form the combination of Heck's and Mule's device in the above manner for the purpose of forming external connection.

58. Regarding **claims 48-49**, figures 1-8 (one embodiment) and related text of Heck and figures 1a-1c of Mule substantially disclose the claimed invention except the integrated circuit package structure comprises a lead frame and a ceramic package.

However, in the same field of endeavor figure 23 of Silverbrook discloses an integrated circuit package structure comprises 216 (lead frame) (paragraph [0069]) and a ceramic package (paragraph [0002]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Heck's and Mule's with the teachings Silverbrook by attaching the MEMS device to a lead frame and ceramic package. The ordinary artisan would have been motivated to form the combination of Heck's and Mule's device in the above manner for the purpose of connecting the MEMS device with other external devices and to form good device protection.

59. **Claim 41**, is rejected under 35 U.S.C. 103(a) as being unpatentable over Heck et al. (US 2003/0183916, dated October 2nd, 2003, filed March 27th, 2002; Hereinafter Heck) in view of Mule' et al. (US 2002/0136481, dated September 26th, 2002, filed February 11th, 2002; hereinafter Mule) as applied to claim 40 above, and further in view of Partridge et al. (US 2004/0245586, dated December 9th, 2004, filed June 4th, 2003; hereinafter Partridge).

60. Regarding **claim 41**, figures 1-8 (one embodiment) and related text of Heck and figures 1a-1c of Mule substantially disclose the claimed invention except the barrier layer comprises a metal material.

However, in the same field of endeavor, figure 12 of Partridge discloses the barrier layer 28b & 28C comprises a metal material (paragraph [0092] & [0093]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the barrier layer of Heck's and Mule's device with metal material as taught by Partridge. The ordinary artisan would have been motivated to form Heck's and Mule device barrier layer with a metal material in order to provide good protection for the MEMS device.

61. **Claim 46**, is rejected under 35 U.S.C. 103(a) as being unpatentable over Heck et al. (US 2003/0183916, dated October 2nd, 2003, filed March 27th, 2002; Hereinafter Heck) in view of Mule' et al. (US 2002/0136481, dated September 26th, 2002, filed February 11th, 2002; hereinafter Mule) as applied to claim 42 above, and further in view of Barth et al. (US 2006/0014374, dated January 19th, 2006, filed June 3rd, 2003; hereinafter Barth).

62. Regarding **claim 46**, figures 1-8 (one embodiment) and related text of Heck and figures 1a-1c of Mule substantially disclose the claimed invention except the step of thermally decomposing the sacrificial layer occurs inside the vacuum chamber.

However, in the same field of endeavor, figure 1E of Barth et al discloses the method of decomposing the sacrificial layer 112 (paragraph [0062]) is formed inside the vacuum chamber (paragraph [0028]).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to form Heck's and Mule's device by thermally decomposing the sacrificial layer inside a vacuum chamber as taught by Barth. The ordinary artisan

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would have been motivated to form Heck's and Mule's device in the above manner for the purpose of forming particle free cavity.

Response to Arguments

63. Regarding claim 24, the Applicant's argues that the sacrificial layer of Heck's device **pass through** the overcoat layer, but the presently claimed invention the sacrificial layer **permeate through** the overcoat layer. First, it is unclear the difference between the "pass through" or "permeate through". According to <http://dictionary.reference.com/>, the definition of **permeate** is **1. to pass into or through every part of.**

64. Second, the applicant argues that Heck overcoat layer is not contiguous and is not formed without openings. However, the examiner respectfully disagrees. Heck teaches the overcoat layer can be formed without openings. Paragraph [0021] of Heck is copied here for clarity "[0021] In one embodiment, the cover 20 may be formed **without openings 32** by making the cover 20 sufficiently porous to pass the decomposed layers 15 and 25. In such an embodiment, the sealing material 34 thereafter provides the barrier needed to seal the cavity 22"

65. For the reasons mentioned above the applicant's argument is not found persuasive.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YOSEF GEBREYESUS whose telephone number is (571)270-5765. The examiner can normally be reached on Monday through Thursday 7:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne A. Gurley can be reached on 571-272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/YOSEF GEBREYESUS/
Examiner, Art Unit 2811
05/13/2011

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